



A.D. 1875, 25th OCTOBER.

N° 3703.

SPECIFICATION

OF

CHRISTOPHER RAWSON
AND
JOHN WILLIAM SLATER.

TREATING SEWAGE, &c.

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Treating Sewage, &c.

LETTERS PATENT to Christopher Rawson, of No. 9, Victoria Chambers, in the City of Westminster, Managing Director to the Native Guano Company (Limited), and John William Slater, of No. 2, Tamworth Terrace, in the County of Middlesex, Analytical Chemist, for the Invention of “**IMPROVEMENTS IN THE TREATMENT OR PURIFICATION OF SEWAGE AND OTHER MATTERS, AND IN THE TREATMENT OR PREPARATION OF AGENTS TO BE USED IN THE SAID PURIFICATION.**”

Sealed the 20th December 1875, and dated the 25th October 1875.

PROVISIONAL SPECIFICATION left by the said Christopher Rawson and John William Slater at the Office of the Commissioners of Patents, with their Petition, on the 25th October 1875.

We, **CHRISTOPHER RAWSON**, of No. 9, Victoria Chambers, in the City
5 of Westminster, Managing Director to the Native Guano Company
(Limited), and **JOHN WILLIAM SLATER**, of No. 2, Tamworth Terrace,
in the County of Middlesex, Analytical Chemist, do hereby declare the
nature of the said Invention for “**IMPROVEMENTS IN THE TREATMENT OR
PURIFICATION OF SEWAGE AND OTHER MATTERS, AND IN THE TREATMENT OR**

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PREPARATION OF AGENTS TO BE USED IN THE SAID PURIFICATION," to be as follows:—

Our Invention relates, firstly, to certain processes for purifying sewage liquid, night soil, dye waters, or other refuse waters, or such waters mixed with sewage and other liquid matters by precipitation. In such processes as ordinarily practised alum or sulphate of alumina or other salts of alumina or alum sludge, either alone or in combination with other agents, is or are mixed with the sewage to be purified. Now the object of this part of our Invention is to provide a cheap substitute for the manufactured alum or sulphate of alumina or other salts of alumina or alum sludge thus used.

According to this part of our Invention we substitute for the said manufactured alum sulphate of alumina or other salts of alumina or alum sludge, raw or natural aluminous schists or shales, or bituminous and oil schists or shales, or oil rock or carboniferous shists or shales, or rock (burnt, carbonized, or raw) containing alumina, or the refuse of any of these shists or shales, or "oil rock" after the bitumen or oil has been extracted from them or it. These schists or shales contain sulphate and sulphide of iron, sulphate of alumina, alumina and sulphur, which sulphur in contact with moist air becomes oxidised to sulphuric acid, which forms a crude sulphate of alumina suitable in its raw state for the treatment of sewage and other matters. Some shales contain ready-formed sulphate of alumina, potash, alum, and other salts useful for the treatment of sewage and other matters. We use the said schists or shales in their natural or raw state (i.e. without ustulation or calcination), either alone or in admixture with the steamed shales herein-after referred to, or other matters or agents in the treatment of sewage and other matters. When we use the said schists or shales alone we simply grind them (when necessary), and mix them with the sewage or other matters to be purified. When we use them in purifying sewage by the process described in the Specification of Letters Patent granted to William Cameron Sillar, Robert George Sillar, and George William Wigner, and bearing date the 15 June 1868 (which process is commonly known as the "A. B. C. process"), we omit from the "A. B. C. mixture," the manufactured alum or sulphate of alumina heretofore used in the said process, and add the said raw schists or shales, or the steamed schists or shales herein-after referred to, or a mixture of both raw and steamed schists or shales in lieu of such alum or sulphate of alumina to the blood, clay, charcoal,

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and other remaining ingredients (all or any of them), and thus effect a great saving in the cost of the said process; or we first mix the blood, clay, and charcoal (or any of them) with the sewage, and then add the necessary quantity of the aluminous schists or shales, either raw shales
5 or steamed shales, or both. The said schists or shales, either raw schists or shales or steamed schists or shales, or both, may also be used in substitution for manufactured alum, sulphate of alumina, or other salts of alumina or alum sludge in all other sewage precipitating processes in which such alum or salts or sludge is, are, or may be
10 used.

When the aluminous schists or shales used contain an injurious quantity of sulphate of iron we extract it, or some of it, by any suitable process.

Our Invention consists further in treating night soil and other putrescent or putrescible organic matters with either the aforesaid raw
15 aluminous schists or shales or with the aforesaid steamed aluminous schists or shales, or with a mixture of both raw and steamed schists or shales, and thereby deodorizing such organic matters or arresting the decomposition thereof.

Our Invention further consists in using for the precipitation or
20 purification of sewage the aforesaid raw or natural aluminous schists or shales, or the aforesaid steamed schists or shales, or both in conjunction or admixture with bituminous and oil schists or shales or "oil rock," or carboniferous schists or shales or rock (burnt, carbonized, or raw), or the refuse of any of these schists or shales or "oil rock" after
25 the bitumen or oil has been extracted from them, or it, any, or all of them, as may be desirable.

The mixture of the aforesaid aluminous schists or shales, and the bituminous or oil schists or shales or "oil rock," or the carboniferous schists or shales or rock, or the refuse thereof, may be used either alone
30 for the precipitation or purification of the sewage, or in addition to, or admixture with, other precipitating or purifying matters. When thus used the said bituminous or oil schists or shales, or "oil rock," or carboniferous schists or shales, or rock, or the refuse thereof, constitute or constitutes a cheap substitute for the charcoal or carbon heretofore
35 used in processes for purifying sewage, and in some instances may be substituted for the clay heretofore used in such processes.

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The said bituminous schists or shales, and the other schists or shales of that class, or the refuse thereof, may also be applied either by themselves or itself, or in conjunction or admixture with the aforesaid aluminous schists or shales or other agents, to the treatment of night soil and other putrescent or putrescible organic matters. 5

Our Invention further consists in treating or preparing the aluminous schists or shales, or bituminous and oil schists or shales, or "oil rock," or carboniferous schists or shales, or rock (burnt, carbonized, or raw), containing alumina or the aforesaid refuse of these schists or shales, or "oil rock," as herein-after described, for the treatment of sewage and 10 other matters instead of using such schists or shales or refuse, as herein-before described, without such preparation. We make the said schists or shales or refuse crushed or otherwise into heaps either in the open air or in suitably constructed chambers, and draw or force through them 15 either steam or steam and atmospheric air, or hot air charged with moisture or sulphurous acid gas either alone or in admixture with such air or steam.

As one method among others of obtaining hot moist air for our purpose we utilize the vapours escaping from the drying cylinders used in drying "native guano" or other manures or matters, or from any 20 other drying apparatus available for our said purpose. When the schists or shales have been thus steamed we apply them to the treatment of sewage and other matters either alone or in addition to or admixture with the raw aluminous schists or shales, or the other agents used for purifying sewage, as herein-before described. 25

When the said schists or shales to be used are deficient in sulphur we add to the said schists or shales in the heaps aforesaid minerals or residues containing sulphur in a cheap and available form.

Our Invention further consists in filtering sewage dye or other refuse waters, or such waters mixed with sewage either through the aforesaid 30 aluminous schists or shales (either raw or steamed) or through the aforesaid bituminous or oil schists, or shales, or "oil rock," or carboniferous schists or shales or rock (burnt, carbonized, or raw), or the carboniferous refuse aforesaid, or through a mixture of both classes of such schists or shales, or through the aforesaid carboniferous refuse 35 alone, or through any of these agents mixed with any other suitable carboniferous matter. This filtration may either be in addition to

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or in substitution for the "A. B. C. process" or other precipitating processes.

We are aware that aluminous schists or shales have been ustulated or calcined (sometimes with the addition of sulphur minerals) for the
5 manufacture of alum and sulphate of alumina and alum sludge, and that such schists or shales have been exposed to air and rain for considerable periods (without ustulation) and then lixiviated. We are also aware that calcined or ustulated schists or shales have been treated with sulphurous acid gas, steam, and air; but we dispense with the
10 ustulation or calcination of the said schists or shales, and also with the prolonged exposure to air and rain aforesaid, and thus prevent the escape of sulphurous fumes and the consequent nuisance, and save money, time, and labour.

SPECIFICATION in pursuance of the conditions of the Letters Patent,
15 filed by the said Christopher Rawson and John William Slater in the Great Seal Patent Office on the 25th April 1876.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, CHRISTOPHER RAWSON, of No. 9, Victoria Chambers, in the City of Westminster, Managing Director to the Native Guano Company (Limited),
20 and JOHN WILLIAM SLATER, of No. 2, Tamworth Terrace, in the County of Middlesex, Analytical Chemist, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-fifth day of October, in the year of our Lord One thousand eight hundred and seventy-five, in the
25 thirty-ninth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said Christopher Rawson and John William Slater, Her special license that we, the said Christopher Rawson and John William Slater, our executors, administrators, and assigns, or such others as we, the said Christopher Rawson and
30 John William Slater, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man,

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an Invention for "IMPROVEMENTS IN THE TREATMENT OR PURIFICATION OF SEWAGE AND OTHER MATTERS, AND IN THE TREATMENT OR PREPARATION OF AGENTS TO BE USED IN THE SAID PURIFICATION," upon the condition (amongst others) that we, the said Christopher Rawson and John William Slater, our executors or administrators, by an instrument in writing 5 under our or their hands and seals, or under the hand and seal of one of us or them, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said 10 Letters Patent.

NOW KNOW YE, that I, the said Christopher Rawson, on behalf of myself and the said John William Slater, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the 15 following statement thereof, that is to say:—

Our Invention relates, firstly, to certain processes for purifying by precipitation sewage liquid, night soil, dye waters, or other refuse waters, or such waters mixed with sewage and other liquid matters. In such processes as ordinarily practised alum or sulphate of alumina, or other 20 salts of alumina or alum sludge, either alone or in combination with other agents is or are mixed with the sewage to be purified. Now the object of this part of our Invention is to provide a cheap substitute for the manufactured alum or sulphate of alumina or other salts of alumina or alum sludge thus used. 25

According to this part of our Invention we substitute for the said manufactured alum sulphate of alumina or other salts of alumina or alum sludge, raw or natural aluminous schists or shales, or minerals. These schists or shales contain sulphate and sulphide of iron, sulphate of alumina, alumina and sulphur, which sulphur in contact with moist air 30 becomes oxidised to sulphuric acid, which forms a crude sulphate of alumina suitable in its raw state for the treatment of sewage and other matters. Some shales contain ready formed sulphate of alumina, potash, alum, and other salts useful for the treatment of sewage and other matters, and such shales are applicable to our purpose. We use the 35 said schists or shales in their natural or raw state (i.e. without ustulation or calcination), either alone or in admixture with the steamed or

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prepared shales herein-after referred to, or other matters or agents in the treatment of sewage and other matters. When we use the said schists or shales alone we simply grind them when necessary and mix them with the sewage or other matters to be purified. When we use
5 them in purifying sewage by the process described in the Specification of Letters Patent granted to William Cameron Sillar, Robert George Sillar, and George William Wigner, and bearing date 15th June 1868 (which process is commonly known as the "A. B. C. process"), we omit from the A. B. C. mixture the manufactured alum or sulphate of
10 alumina heretofore used in the said process, and add the said raw schists or shales, or the steamed schists or shales herein-after referred to, or a mixture of both raw and steamed schists or shales in lieu of such alum or sulphate of alumina to the blood, clay, charcoal, and other remaining ingredients (all or any of them), and thus effect a great saving in the
15 cost of the said process. Or we first mix the blood, clay, and charcoal (or any of them) with the sewage, and then add the necessary quantity of the aluminous schists or shales, either raw shales or steamed shales or both. The said aluminous schists or shales, either raw shales or steamed shales or both may also be used in substitution for the manufactured
20 alum, sulphate of alumina, or other salts of alumina or alum sludge in all other sewage precipitating processes in which such alum or salts or sludge is, are, or may be used.

When the aluminous schists or shales used contain an injurious quantity of sulphate of iron we extract it or some of it by any suitable
25 process.

As regards the proportions in which the aluminous schists or shales are to be used in the treatment of sewage great variation must necessarily prevail in consequence of the varying strength and character of the said schists or shales, the nature of the sewage, and according to the degree of
30 purity to which the effluent water is to be brought. When we use the said schists or shales without other precipitants we mix effloresced Campsie shales (i.e. the shales found principally in the carboniferous limestone strata at Campsie near Glasgow, Scotland), or other shales of similar chemical composition with the sewage in the proportion of from
35 15 to 20lbs. of the said schists or shales to 1000 gallons of sewage, but we do not limit ourselves to this proportion. If the sewage be neutral or acid so much lime must be added that the effluent water shall be exactly neutral. Care must be taken that such lime is not allowed to

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enter the sewage simultaneously with the schists or shales, but that it is either mixed with the sewage previously to the introduction of the schists or shales, or else not until they have been fully incorporated with the sewage.

When we use the said schists or shales in substitution for the alum 5 referred to in the A. B. C. mixture described in the aforesaid Specification of William Cameron Sillar, Robert George Sillar, and George William Wigner, we add to the said mixture a quantity of the said schists or shales equal to twice or thrice the weight of the said alum. When we add so the said A. B. C. mixture, a mixture of the aforesaid 10 raw schists or shales, and the steamed or prepared schists or shales herein-after referred to, we use equal weights of both classes of shales. Or instead of using the aforesaid schists or shales with the aforesaid A. B. C. mixture we use an A. B. C. mixture composed as follows:—

Raw effloresced "Campsie" shale (or					15
equivalent shale) or a mixture of					
such shale and steamed shale as					
aforesaid - - - - -	-	-	-	10 to 12 lbs. by weight.	
Clay - - - - -	-	-	-	10 to 20 lbs. by weight.	
Charcoal - - - - -	-	-	-	10 to 12 lbs. by weight.	20
Blood - - - - -	-	-	-	4 to 8 ozs. by weight.	

We prefer to mix the blood with the clay before adding them to the aforesaid mixture.

The above weights are sufficient for 1000 gallons of sewage.

Our Invention consists further in treating or preparing aluminous 25 schists, or shales, or minerals, as herein-after described, for the treatment of sewage and other matters instead of using such schists or shales as herein-before described without such preparation. We make the said schists or shales (crushed or otherwise) into heaps, either in the open air or in suitably constructed chambers, of masonry or sheet lead, and 30 draw or force through the said schists or shales either superheated steam, or steam and atmospheric air, or hot air charged with moisture or sulphurous acid gas in admixture with such air or steam.

As one method, among others, of obtaining hot moist air for our purpose, we utilize the vapours escaping from the drying cylinders used 35

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in drying native guano and other matters (which cylinders are described in the Specification of a Patent granted to William Alfred Gibbs and Alfred Borwick, and dated 31st January, A.D., 1872, No. 314, or from any other drying apparatus available for our said purpose. When the
5 said schists or shales have been thus steamed or treated we apply them to the treatment of sewage, and other matters either alone or in addition to or admixture with the raw aluminous schists or shales, or the other agents used for purifying sewage, as herein-before described.

When the said schists or shales to be used are deficient in sulphur
10 we add to them in the heaps aforesaid, minerals, or residues, containing sulphur in a cheap and available form.

We are aware that aluminous schists or shales have been ustulated or calcined (sometimes with the addition of sulphur minerals) for the manufacture of alum, and sulphate of alumina, and alum sludge, and
15 that such schists or shales have been exposed to air and rain for considerable periods without ustulation and then lixiviated. We are also aware that calcined or ustulated schists or shales have been treated with sulphurous acid gas, steam, and air; but we dispense with the ustulation or calcination of the said schists or shales, and also with the
20 prolonged exposure to air and rain aforesaid, and thus prevent the escape of sulphurous fumes and the consequent nuisance, and save money, time, and labour.

Having now described the nature of our Invention, and the manner in which the same is to be performed, we wish it to be understood that
25 we do not limit ourselves to the proportions herein-before stated, as they may be varied, without departing from the nature of our said Invention; but we claim as our said Invention,—

Firstly. The substitution of raw or natural aluminous schists or shales, or minerals, or of a mixture of such schists or shales, and the
30 steamed or prepared aluminous schists or shales herein-before referred to for the alum, sulphate of alumina, or other salts of alumina or alum sludge ordinarily used in purifying by precipitation sewage liquid or semi-liquid night soil, dye waters, and other refuse waters.

Secondly. Treating or preparing aluminous schists, or shales, or
35 minerals, as herein-before described, for purifying by precipitation sewage and other matters, that is to say, passing through such schists,

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or shales, or minerals, steam, or steam and atmospheric air, or hot air charged with moisture, or a mixture of sulphurous acid gas and steam, or a mixture of sulphurous acid gas and hot air.

In witness whereof, I, the said Christopher Rawson, have hereunto set my hand and seal, this Twenty-fourth day of April, in the 5 year of our Lord one thousand eight hundred and seventy-six.

C. RAWSON. (L.S.)

Witness,

GEORGE BAXTER,

262, Vauxhall Bridge Road,
Pimlico.

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LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1876.

